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Proposals 048–051 to amend the International Code of Botanical Nomenclature

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(048–051) Proposals to exclude the phylum *Microsporidia* from the Code.

(048) Add to Preamble paragraph 7 after "slime moulds" the following phrase:
", but excluding the phylum *Microsporidia*;"

(049) Add to the end of Art. 13.1(d) the following sentence:
"Microsporidian names are governed by the International Code of Zoological Nomenclature (see Preamble 7)."

(050) Remove Art. 45 Ex. 10.

(051) Add to Art. 54.1(a) after the word "plants":
", including all *Microsporidia,*".

The phylum *Microsporidia* comprises more than 150 genera and 1,200 species of obligate intracellular parasites of eukaryotes (Keeling & Fast in Ann. Rev. Microbiol. 56: 93– 116. 2002). All microsporidia produce infective spores that

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contain a characteristic distinctively coiled polar filament. Microsporidians are easily recognized and distinguished from all other groups of microscopic eukaryotes. They are also unusual at the physiological level in that they have relic mitochondria termed mitosomes.

The phylum *Microsporidia* has been either ignored in eukaryote systematics or treated as a group of protozoa (e.g., Levine & al. in J. Protozool. 27: 37–58. 1980; Cavalier-Smith in Microbiol. Rev. 57: 953–994. 1993; Wittner & Weiss, The Microsporidia and Microsporidiosis. 1999), with interesting exceptions (Starobogatov in USSR Acad. Sci., Proc. Zool. Inst. 144: 19. 1986). The lack of traditional mitochondria, and accompanying mitochondrial DNA, also led to the notion that they were particularly ancient eukaryotes (Cavalier-Smith in Schenk & Schwemmler, Endocytobiology II: Intracellular Space as Oligogenetic: 1027–1034. 1983). Their exceedingly reduced genomes and highly divergent genes (Keeling & al. in Folia Parasitol. 52: 8–14. 2005) further delayed molecular phylogenetic placement of the group.

A consensus has emerged from molecular phylogenies that the *Microsporidia* are related to fungi (Keeling in Molec. Biol. Evol. 13: 1297–1305. 1996; Edlind in Molec. Phylog. Evol. 5: 359–367. 1996; Hirt & al. in Proc. Natl. Acad. Sci U.S.A. 96: 580–585. 1999; Gill & Fast in Gene 375: 103– 109. 2006). Consequently some taxonomic and evolutionary schemes treat the *Microsporidia* as fungi (Keeling & al. in Trends Ecol. Evol. 20: 670–676. 1995; Cavalier-Smith in Biol. Rev. 73: 247. 1998; Doweld, Prosyll. Tracheophyt. 77. 2001; Adl & al. in J. Eukaryot. Microbiol. 52: 399–451. 2005; Kirk & al., Dict. Fungi, ed. 10. 2008), a realization that if fully carried into the realm of nomenclature would bring with it unwanted consequences. Descriptions of virtually all the species and genera lack Latin diagnoses and/or descriptions. Prior to changes to Art. 45.4 in the International Code of Botanical Nomenclature in Vienna in 2005 (McNeill & al. in Regnum Veg. 146. 2006), names for most microsporidians described after 1935 would not have been validly published under the ICBN. However, such a strong tradition exists in treating *Microsporidia* as protozoans, that even today in research articles where *Microsporidia* are acknowledged to be fungi, new taxa are being named and described without Latin diagnoses or descriptions as required since 1935 by the ICBN for taxa governed by that Code which includes fungi.

The simplest solution for names for taxa in the phylum is to return to the pre-2005 situation by excluding the *Microsporidia* from the ICBN (Redhead, Cushion & Frenkel in J. Eukaryot. Microbiol. 53: 8. 2006). The International Commission on Zoological Nomenclature via the Executive Secretary (Dr. Ellinor Michel, pers. comm., June 2008) confirmed that the ICZN (Ride & al., Intern. Code Zool. Nomencl. 1999 & http://www.iczn.org/iczn/index.jsp)

could continue to cover the names for microsporidians under its Art. 1.1.1. Researchers working on *Microsporidia* have requested that these taxa continue to be treated nomenclaturally as protistans under the ICZN (Weiss in Folia Parasitol. 52: 1–7. 2005). Excluding an easily characterized group traditionally treated as protistan and not fungal (ICBN Preamble 7) is the logical and pragmatic approach. Few complications arise from exclusion of the *Microsporidia*. Despite being excluded from the ICBN as a group, there will continue to be impact from ICBN Art. 54.1(a) regarding homonyms covered by the ICBN.